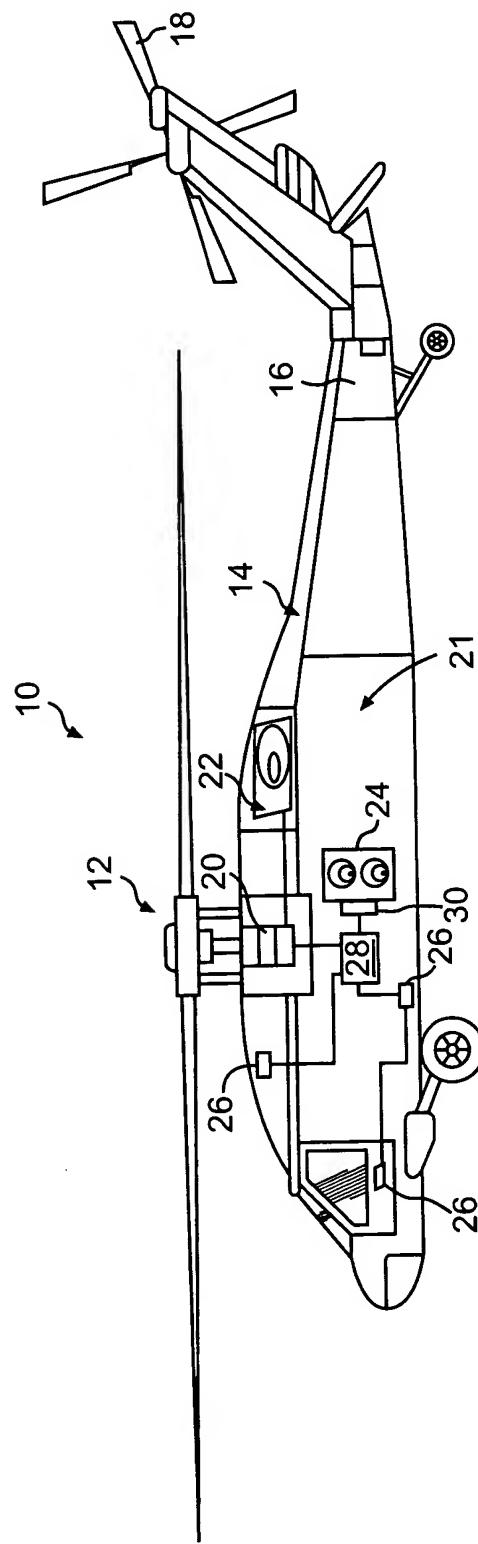


HARMONIC FORCE GENERATOR FOR AN ACTIVE VIBRATION CONTROL SYSTEM  
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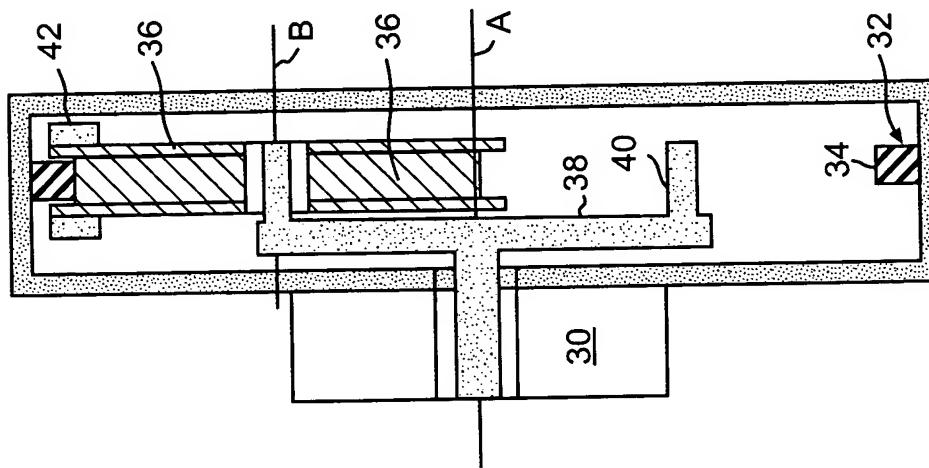
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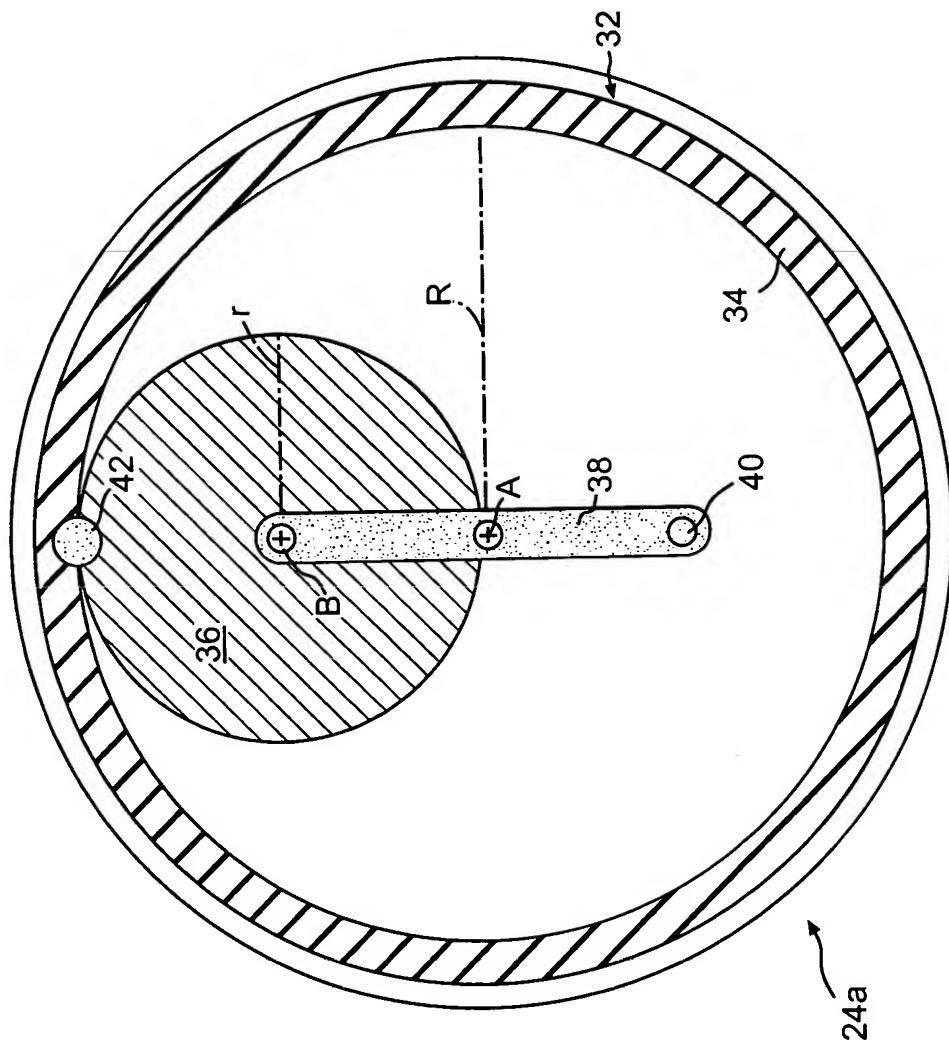
**FIG. 1**

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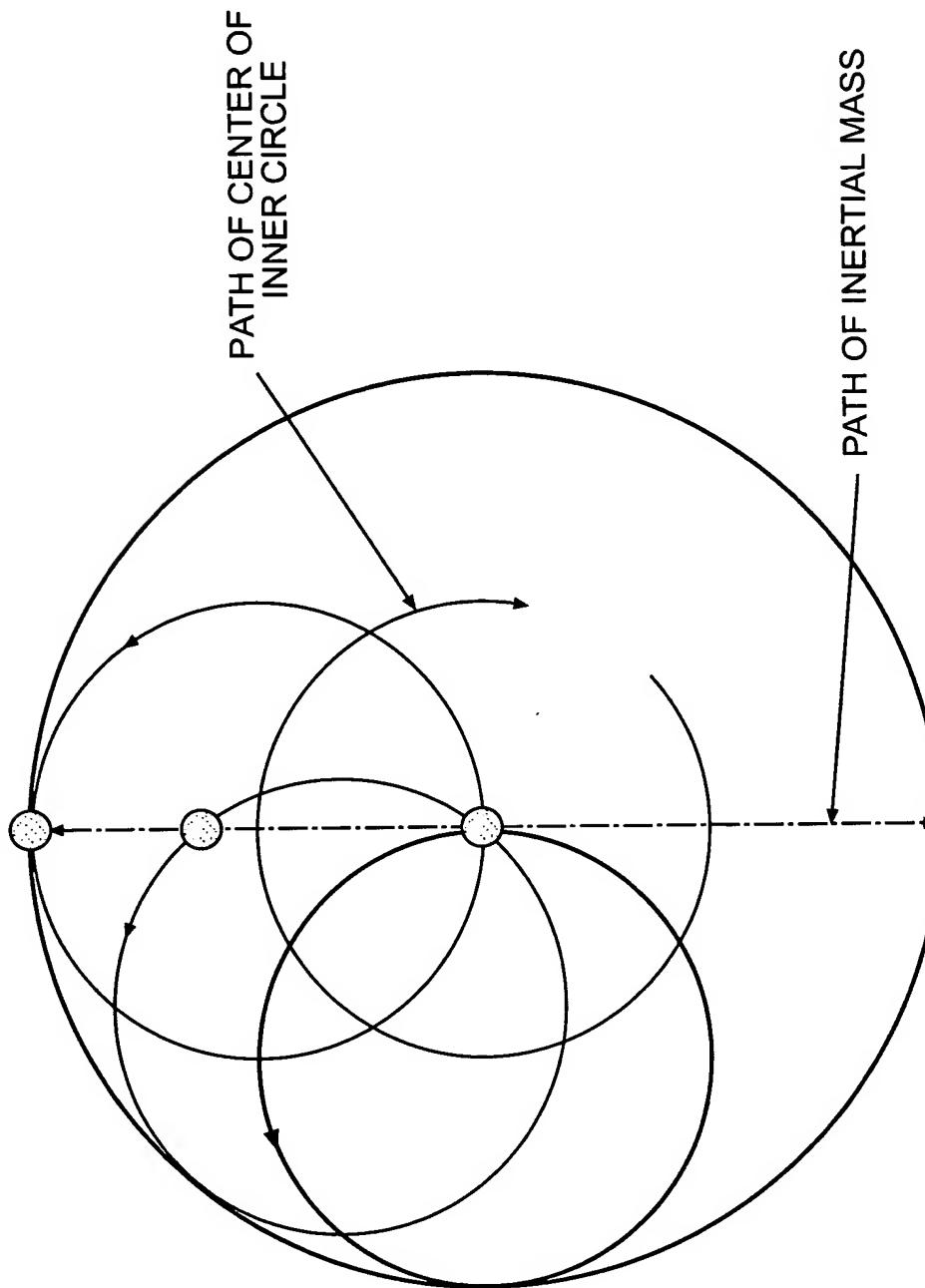


**FIG. 2B**



**FIG. 2A**

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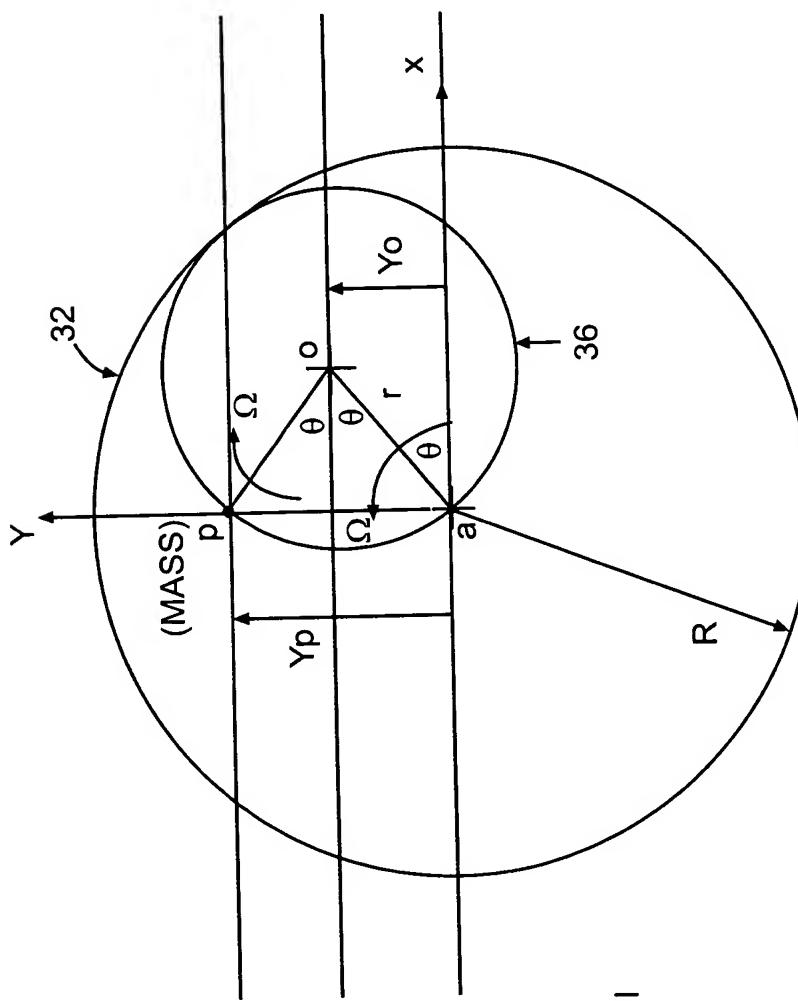


**FIG. 3**

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IMPROVED HARMONIC FORCE GENERATOR  
 EQUATIONS OF MOTION

OUTER CIRCLE WITH CENTER  $a$  AND RADIUS  $R$   
 INNER CIRCLE WITH CENTER  $o$  AND RADIUS  $r$

$$R = 2r$$

CIRCUMFERENCE OF INNER CIRCLE:  
 $c = 2\pi r$

CIRCUMFERENCE OF OUTER CIRCLE:  
 $c = 2\pi R = 2c$

INNER CIRCLE ROLLS AROUND INSIDE THE  
 OUTER CIRCLE WITH ANGULAR VELOCITY  $\Omega$   
 AS INNER CIRCLE COMPLETES ONE ORBIT,  
 IT SIMULTANEOUSLY COMPLETES ONE  
 REVOLUTION ABOUT ITS CENTER.  
 THEREFORE THE ANGULAR VELOCITIES OF RADII  
 $ao$  AND  $op$  ARE IDENTICAL.

POSITION OF POINT  $p$  ALONG Y AXIS:  
 $y_o = r \sin \theta = r \sin \Omega t$   
 $y_p = 2r \sin \Omega t$

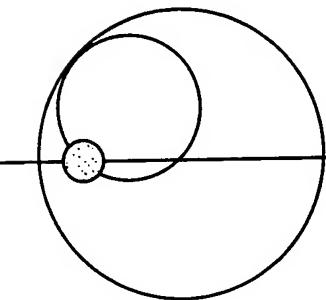
VELOCITY OF POINT  $p$ :  
 $y_p (\text{dot}) = 2r\Omega \cos \Omega t$

ACCELERATION OF POINT  $p$ :  
 $y_p (\text{ddot}) = -2r\Omega^2 \sin \Omega t$

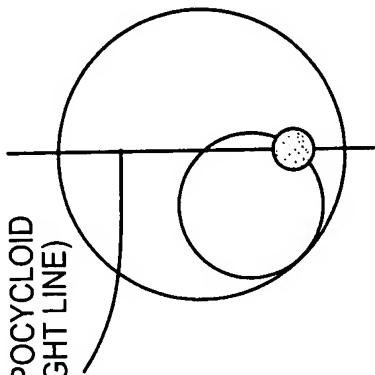
INERTIAL FORCE GENERATED BY a MASS AT  $p$ :  
 $F = ma$   
 $F = mR\Omega^2 \sin \Omega t$

**FIG. 4**

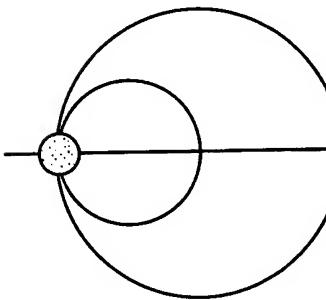
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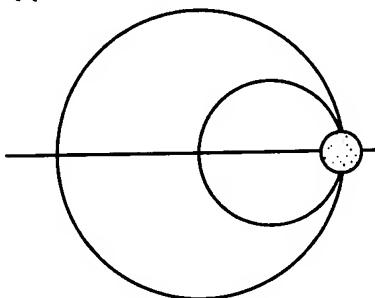
**FIG. 5D**



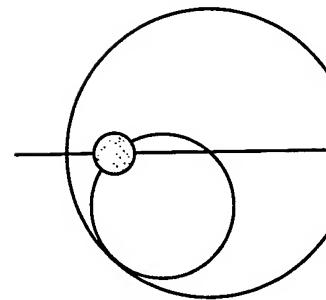
**FIG. 5H**



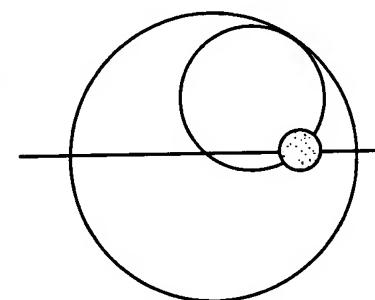
**FIG. 5C**



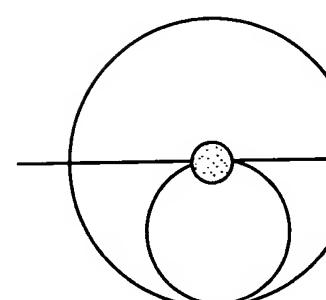
**FIG. 5G**



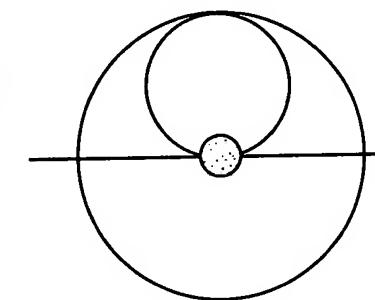
**FIG. 5B**



**FIG. 5F**



**FIG. 5E**



**FIG. 5H**

2-CUSP HYPOCYCLOID  
(A STRAIGHT LINE)

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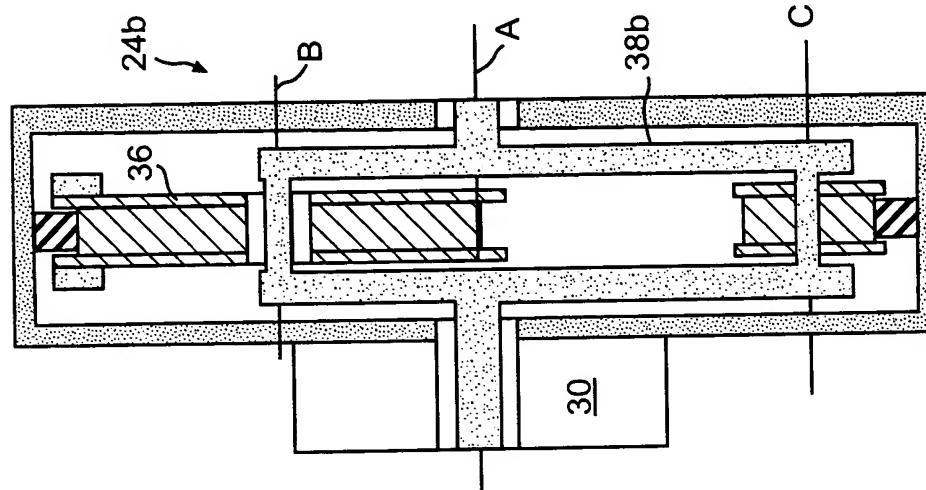
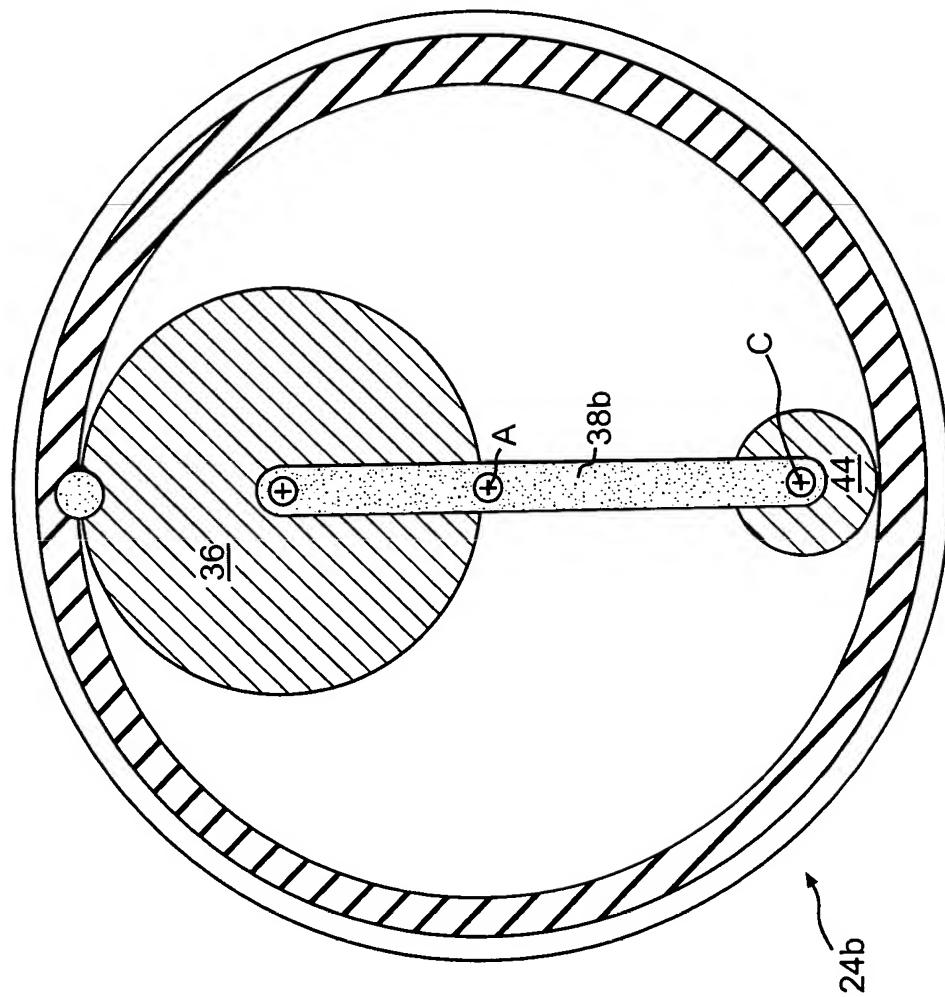


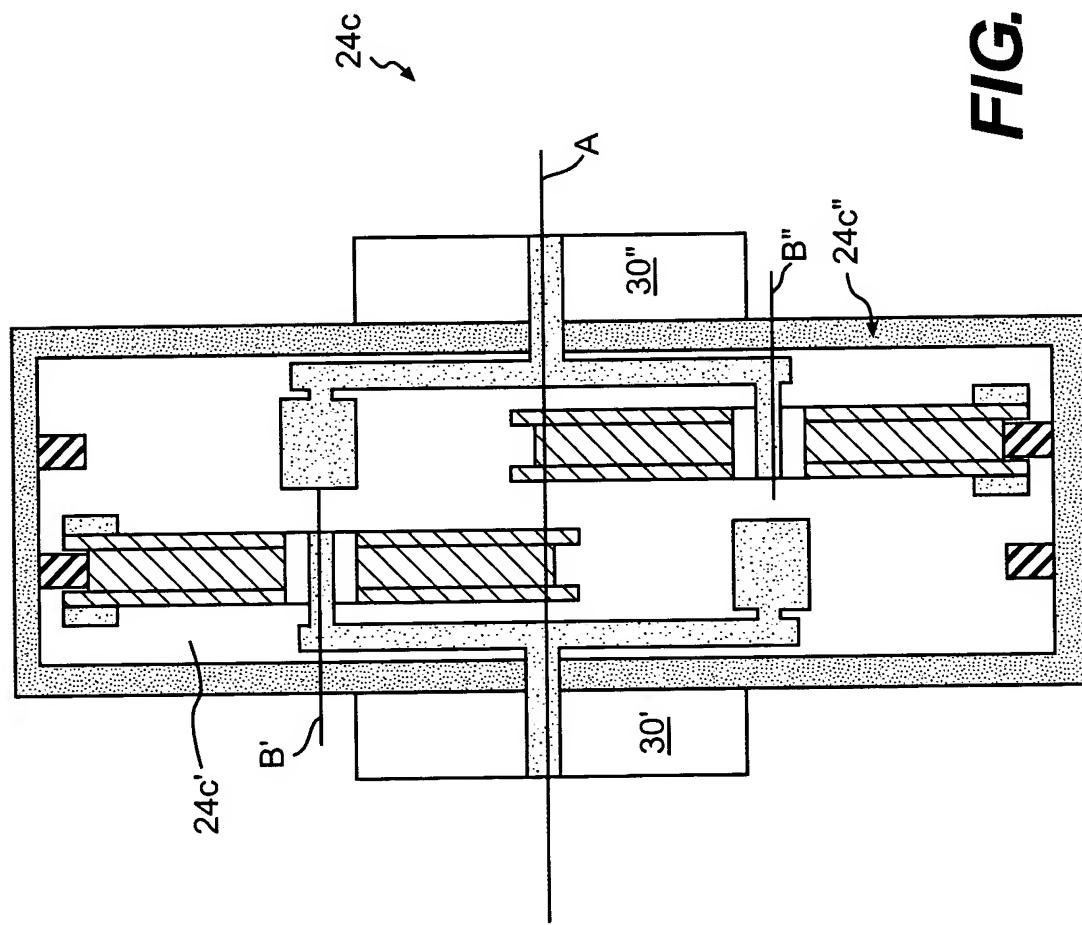
FIG 6B



**FIG. 6A**

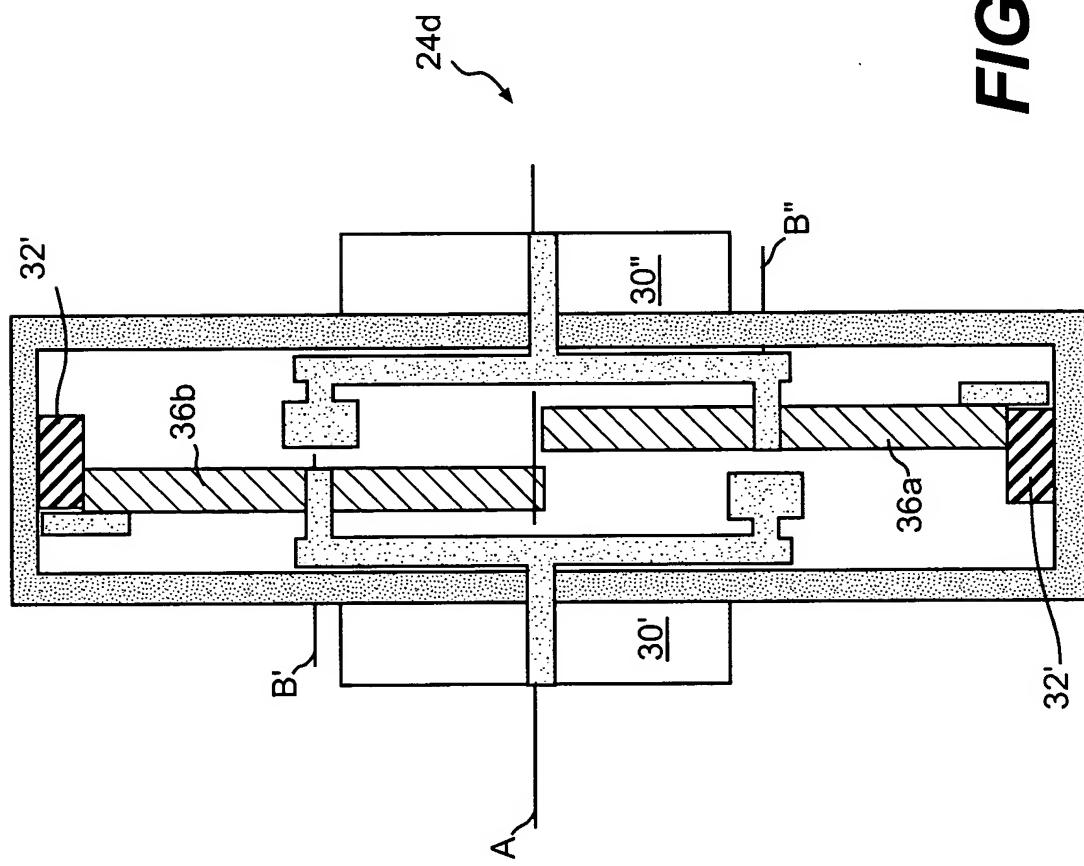
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FIG. 7



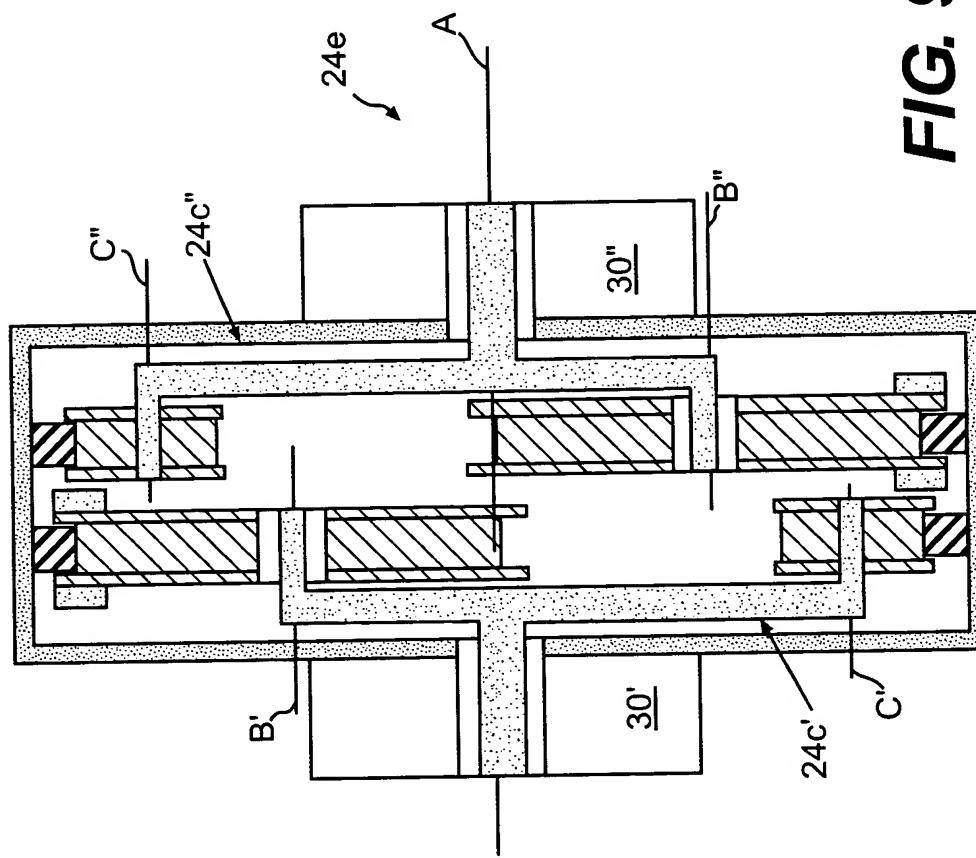
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FIG. 8



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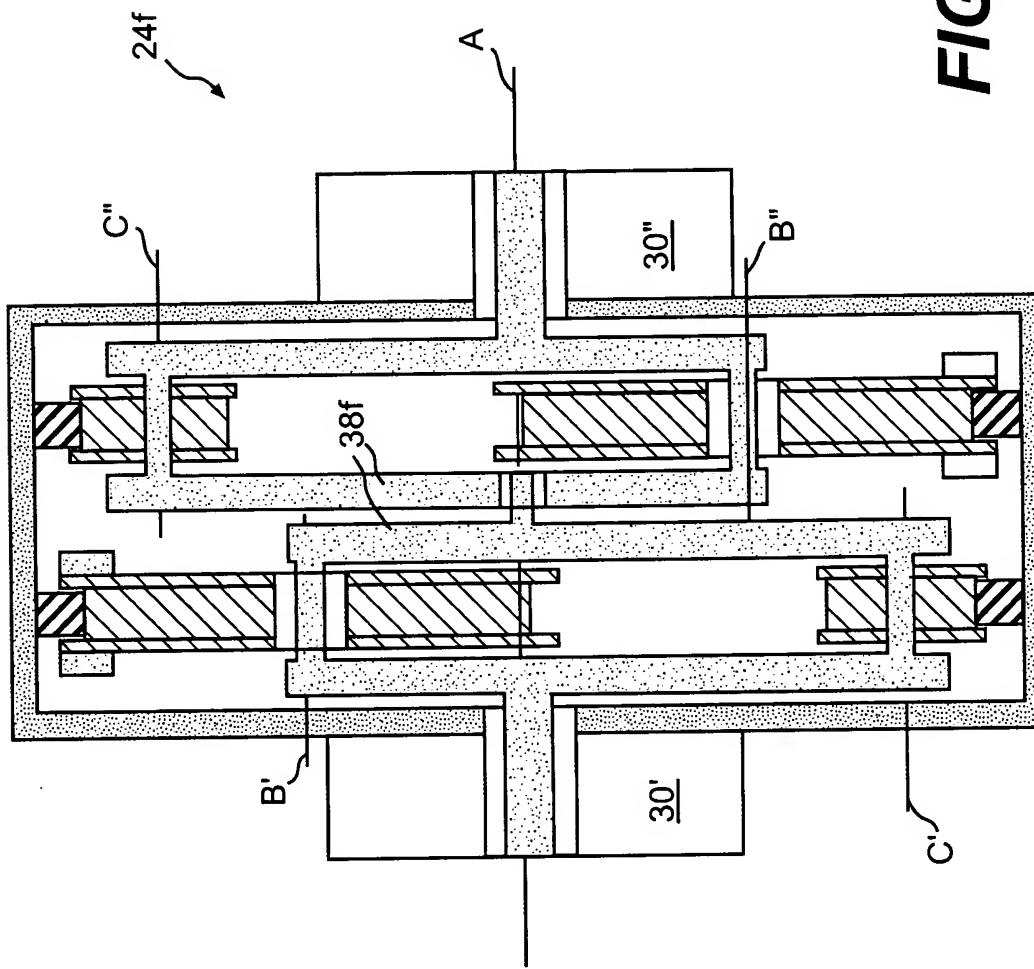
**FIG. 9**



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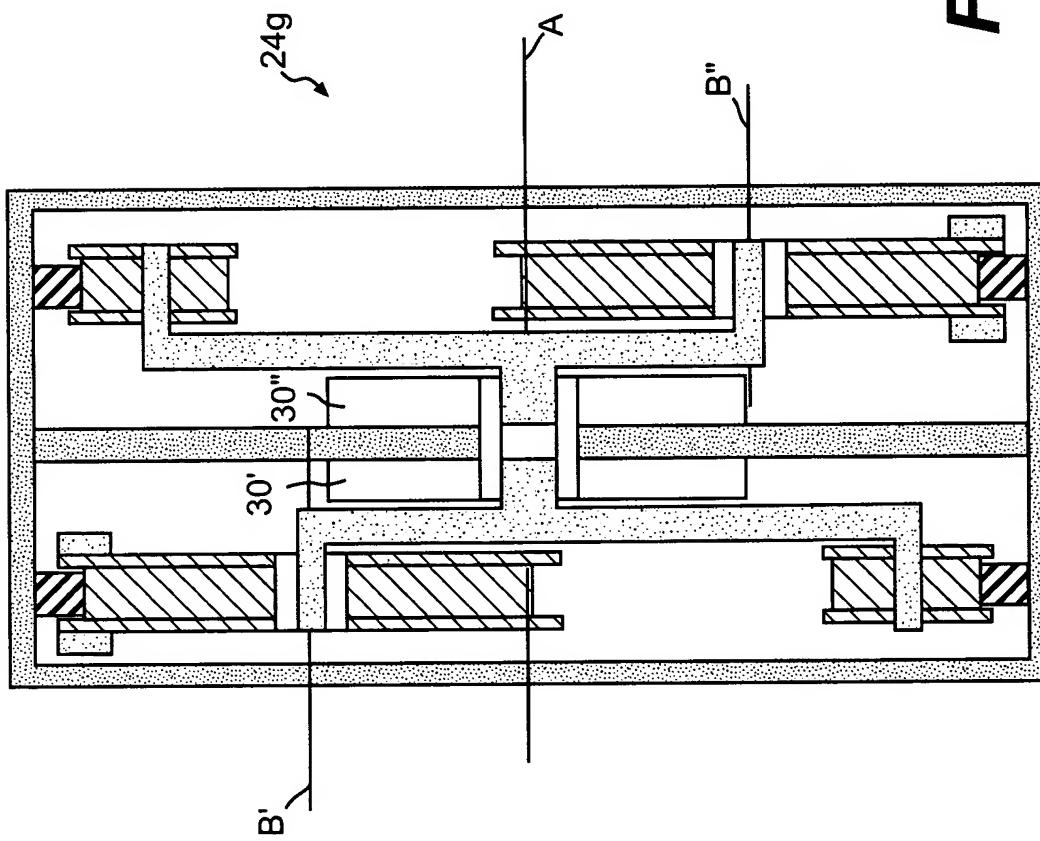
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*FIG. 10*



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FIG. 11



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**FIG. 12**

